

# इंटरनेट

# मानक

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IS 12448-8 (1992): Basic testing procedures and measuring methods for electromechanical components for electronic equipment, Part 8: Connector Tests (Mechanical) and Mechanical Tests on Contacts and Terminations [LITD 3: Electromechanical COmponents and Mechanical Structures for Electronic Equipment]



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भारतीय मानक

इलैक्ट्रानिक उपस्कर के लिये विद्युत यांत्रिक संघटकों की  
मूल परीक्षण कार्यविधियाँ और मापन पद्धतियाँ

भाग 8 सम्पर्क और अन्तस्थों पर कनेक्टर परीक्षण ( यांत्रिक ) और यांत्रिक परीक्षण

*Indian Standard*

**BASIC TESTING PROCEDURES AND  
MEASURING METHODS FOR  
ELECTROMECHANICAL COMPONENTS  
FOR ELECTRONIC EQUIPMENT**

**PART 8 CONNECTOR TESTS ( MECHANICAL ) AND MECHANICAL TESTS ON  
CONTACTS AND TERMINATIONS**

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## FOREWORD

This Indian Standard ( Part 8 ) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

The object of this standard ( Part 8 ) is to lay down uniform methods of tests for connection ( Mechanical ) and mechanical tests on contacts and terminations of Electromechanical Components.

This standard ( Part 8 ) is based, without any technical change, on IEC Pub 512-8 ( 1977 ) 'Electromechanical components for electronic equipment, Basic testing procedures and measuring methods : Part 8 Connector tests ( Mechanical ) and Mechanical tests on contacts and terminations' and IEC Pub 512-8B ( 1980 ), Second supplement to publication 512-8 ( 1977 ), issued by International Electrotechnical Commission ( IEC ).

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values ( *revised* )'.

## *Indian Standard*

# BASIC TESTING PROCEDURES AND MEASURING METHODS FOR ELECTROMECHANICAL COMPONENTS FOR ELECTRONIC EQUIPMENT

### PART 8 CONNECTOR TESTS ( MECHANICAL ) AND MECHANICAL TESTS ON CONTACTS AND TERMINATIONS

#### 1 SCOPE

**1.1** This standard ( Part 8 ) covers test methods for connector test ( mechanical ) and mechanical test on contacts and terminations.

#### 2 REFERENCES

**2.1** The Indian Standards listed below are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
9000 ( Part 19/Sec 1 ) : 1986	Basic environmental testing procedures for electronic and electrical items : Part 19 Test U : Robustness of terminations and integral mounting devices, Section 1 Test Ua1 : Tensile ( <i>first revision</i> ).
12448 ( Part 2/Sec 1 ) : 1988	Basic testing procedures and measuring methods for electromechanical components for electronic equipment : Part 2 General examination, electrical continuity and contact resistance tests insulation tests and voltage stress tests, Section 1 General requirements

#### 3 TEST 15a : CONTACT RETENTION IN INSERT

##### 3.0 General

The object of this test is to detail a standard method to assess the ability of the contact retaining system to withstand the axial mechanical stresses likely to be encountered during normal usage.

##### 3.1 Preparation of the Specimen

The specimen shall consist of a component with all contacts installed according to the detail specification. Loosen or remove any accessories which are not essential for the contact retaining system.

##### 3.2 Test Method

Select 20 percent of the contacts ( but not less than six contacts ) at random for the test. At least one contact shall be near the periphery and one near the centre of the component. For components having six contacts or less, all contacts shall be used for the test.

Specified axial force shall be applied to the contact in both directions consecutively. This force shall be reached by gradual increase at a rate not to exceed 10 N/s until the specified value is reached. This maximum value shall be maintained during 10 s.

After the contact is seated on the retention member, the contact movement shall be measured. The allowable axial displacement of the contacts in relation to the insert, while the force is applied and after the force is removed, shall be stated in the detail specification.

##### 3.3 Final Measurements

The specimen shall be visually examined in accordance with IS 12448 ( Part 2/Sec 1 ) : 1988.

##### 3.4 Requirements

The amount of axial displacement of the contacts in relation to the insert, while the force is applied and after the force is removed, shall not exceed the amount specified and there shall be no damage to or loosening of parts such as would impair the operation of the component.

##### 3.5 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

- a) Preparation of the specimen;
- b) Mounting of the specimen;
- c) Force to be applied and its application point;
- d) Allowable displacement; and
- e) Any deviation from the standard test method.

#### **4 TEST 15b : INSERT RETENTION IN HOUSING ( AXIAL )**

##### **4.0 General**

The object of this test is to detail a standard method to assess the ability of the insert retaining system to withstand the axial mechanical stresses likely to be encountered during normal usage.

##### **4.1 Preparation of the Specimen**

The specimen shall be prepared and mounted in accordance with the detail specification. Cable fittings and accessories shall not be fitted.

##### **4.2 Test Method**

An axial force or test pressure as specified shall be applied to the insert in both directions consecutively. The force or pressure shall be increased steadily at a rate of approximately 50 N/s or 5 kPa/s, respectively up to the specified value and held at that value for 1 min.

*WARNING* — Where air pressure is used, there is a danger of contacts and/or inserts being ejected at high velocity.

##### **4.3 Final Measurements**

The specimen shall be subjected to visual examination in accordance with IS 12448 ) Part 2/ Sec 1 ) :1988.

##### **4.4 Requirements**

There shall be no damage to or displacement of the insert from its original position in the housing such as would impair the operation of the component.

##### **4.5 Details to be Specified**

When this test is required by the detail specification, the following details shall be specified :

- a) Preparation of the specimen;
- b) Mounting of the specimen;
- c) Force or pressure to be applied, method and point(s) of application; and
- d) Any deviation from the standard test method.

#### **5 TEST 15c : INSERT RETENTION IN HOUSING ( TORSIONAL )**

##### **5.0 General**

The object of this test is to detail a standard method to assess the ability of the insert retaining system to withstand the torsional stresses likely to be encountered during normal usage.

##### **5.1 Preparation of the Specimen**

The specimen shall be prepared and mounted in accordance with the detail specification. Cable fittings and accessories shall not be mounted on the component.

##### **5.2 Test Method**

With the housing of the component securely clamped, a specified torque shall be applied to the insert by a suitable test fixture. The torque shall be increased steadily at a rate of approximately 0.5 Nm/s up to the specified value and held for 1 min.

##### **5.3 Final Measurements**

There shall be no movement of the insert in relation to the housing as to cause permanent displacement of the insert that would impair the operation of the component.

##### **5.4 Details to be Specified**

When this test is required by the detail specification, the following details shall be specified:

- a) Preparation of the specimen;
- b) Mounting of the specimen;
- c) Detail of the test fixture;
- d) Torque to be applied and applicable direction;
- e) Requirements for final measurements; and
- f) Any deviation from the standard test method.

#### **6 TEST 15d : CONTACT INSERTION, RELEASE AND EXTRACTION FORCE**

##### **6.0 General**

The object of this test is to detail a standard method to determine the forces required to insert contacts into and extract contacts from their normal position in a component.

##### **6.1 Preparation of the Specimen**

The specimen shall consist of a component and associated contacts. All contacts shall be wired with cable/wire as specified in the detail specification. All contacts shall be installed, except those to be used for the test.

Cable fittings and accessories shall not be mounted on the component, Where applicable, retention devices shall be indexed to the release position.

The component shall be mounted securely in a suitable clamping device and in a position suitable for performing the measurements.

##### **6.2 Test Equipment**

The test equipment shall consist of :

- a) appropriate insertion and extraction tools;
- b) a suitable device for holding the components; and
- c) a suitable device for measuring the forces.

### 6.3 Test Method

Select 20 percent of the contacts ( but not less than six contacts ) at random for the test. For components having six contacts or less, all contacts shall be used for the test. At least one contact shall be near the periphery and one near the centre of the component.

#### 6.3.1 Insertion Force

The insertion tool, with the contact, shall be inserted in the approved manner, maintaining axial alignment and applying sufficient force to insert the contact into its normal position. This insertion force shall not exceed the value stated in the detail specification.

Ascertain that the contacts are correctly inserted and locked.

#### 6.3.2 Release and Extraction Force

The release and extraction forces shall be measured by suitable means.

The extraction tool shall be engaged in the normal manner for the purpose of releasing the contact, while maintaining axial alignment. The releasing shall not exceed that stated in the detail specification.

While maintaining axial alignment, apply sufficient force to the wire and/or tool to extract/eject the contact from the component. The extraction force shall not exceed the value stated in the detail specification.

### 6.4 Final Measurements

The specimen shall be subjected to visual examination in accordance with IS 12448 ( Part 2/ Sec 1 ) : 1988.

### 6.5 Requirements

There shall be no damage that would impair normal operation.

### 6.6 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

- Preparation, mounting and wiring of the specimen;
- Appropriate insertion and extraction tools;
- Maximum insertion, release and extraction forces; and
- Any deviation from the standard test conditions.

### 7 TEST 15e : GROUNDING CONTACT RING HOLDING FORCE

Under consideration.

### 8 TEST 15f : COUPLED STRENGTH TEST ( FOR PUSH-PULL CONNECTORS )

Under consideration.

### 9 TEST 15g : INSERTION ALIGNMENT ( EDGE-SOCKET CONNECTORS )

Under consideration.

### 10 TEST 16a : PROBE DAMAGE

#### 10.0 General

The object of this test is to verify that the elastic system ensuring the contact will not be subject to deterioration in case of insertion of a test probe.

#### 10.1 Test Conditions

The female contact shall be embedded in the appropriate connector insert and locked to prevent its rotation in the insert during the test.

#### 10.2 Requirements for the Test Pin

The test pin shall conform to the following requirements:

- The diameter shall be equal to the maximum diameter of the actual pin of the connector increased by 0.13 mm ( 0.005 in ) for actual pin diameters greater than 0.89 mm ( 0.035 in ) and by 0.076 mm ( 0.003 in ) for actual pin diameters less than 0.89 mm ( 0.035 in );
- The pin shall have a spherical end; and
- It shall be made of hardened steel and shall have a polished surface.

#### 10.3 Test Method

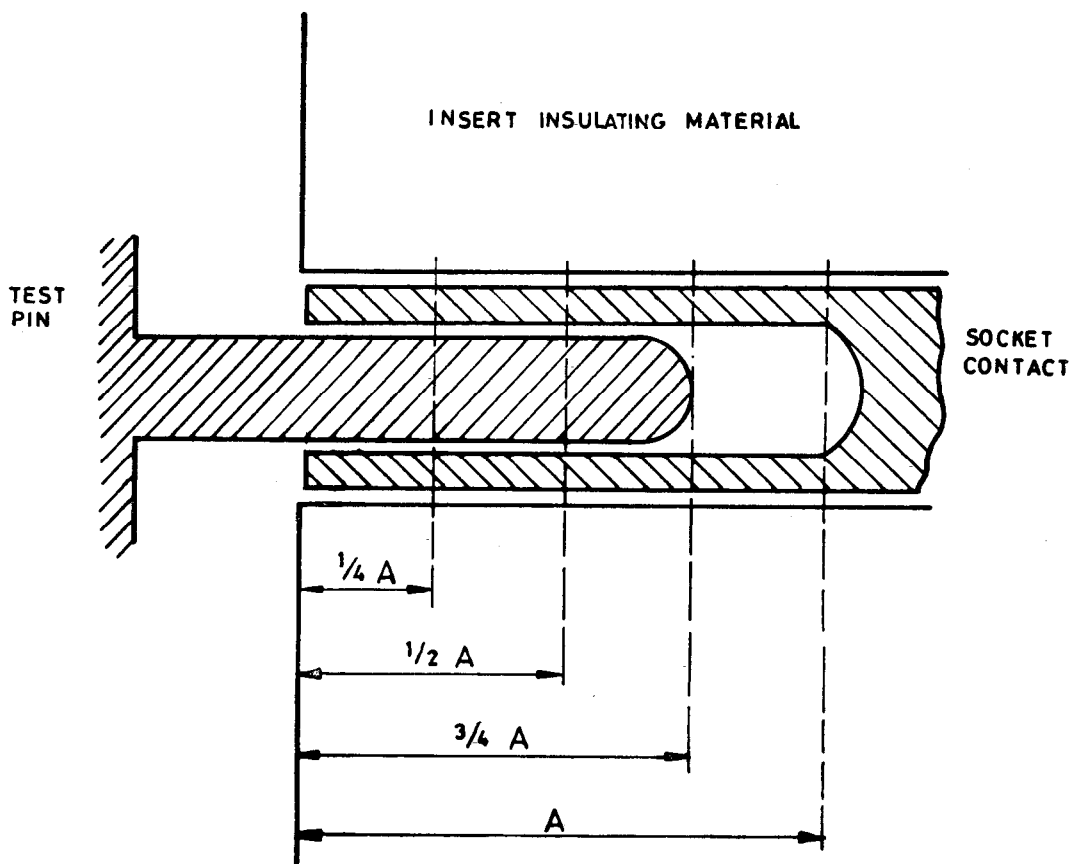
A test pin, of dimensions specified in 10.2, is inserted into the female contact to a depth of  $\frac{3}{4} A$  ( see Fig. 1 ). The axis of the female contact is kept horizontal during the test. The test pin is held by a test device enabling a constant bending moment to be applied to the female contact. With this device free and unsupported the connector is rotated slowly through 360° about its longitudinal axis in such a way that the force is applied uniformly over the entire internal surface of the female contact with the extremity of the test pin.

This operation is repeated with the test pin inserted to a depth  $\frac{1}{2} A$  and then to a depth  $\frac{1}{4} A$  ( see Fig. 1 ).

#### 10.4 Test Requirements

After this test, the female contact shall fulfil the gauge retention force requirements specified in Test 16e ( see 14 ).





**NOTES**

- 1  $A$  = Depth from front end of female contact insert face to bottom of female contact bore excluding curvature at the bottom of the bore.
- 2 Spacers of suitable length and profile may be fitted over the test pin to achieve the specified depth.

**FIG. 1 CROSS SECTION OF TEST PIN INSERTION**

**10.5 Details to be Specified**

When this test is required by the detail specification, the following details shall be specified:

- a) Dimension  $A$  : Minimum depth of female contact bore, measured from the hard face of the insert;
- b) Shape and dimension of the test pin;
- c) Value of the moment to be applied; and
- d) Any deviation from the standard test method.

**11 TEST 16b : RESTRICTED ENTRY**

**11.0 General**

The object of this test is to verify that an over-size pin cannot be inserted into the female contact.

**11.1 Test Method**

A test gauge of specified dimensions shall be applied.

**11.2 Test Requirements**

The test gauge shall not enter the contact.

**11.3 Details to be Specified**

When this test is required by the detail specification, the following details shall be specified:

- a) Details of the test gauge;
- b) Force to be applied; and
- c) Any deviation from the standard test method.

**12 TEST 16c : CONTACT STRENGTH**

Under consideration.

**13 TEST 16d : TENSILE STRENGTH (CRIMPED TERMINATION)**

Under consideration.

## 14 TEST 16e : GAUGE RETENTION FORCE ( RESILIENT CONTACTS )

### 14.0 General

The object of this test is to detail a standard method to measure the holding capability of resilient contacts by means of gauges.

### 14.1 General Requirements

The size and weight of the gauges to be used shall be specified by the detail specification.

### 14.2 Test Methods

#### 14.2.1 Method A, Using Individual-Contact Gauges

##### a) Female contacts

Each contact to be tested shall have a maximum size gauge engaged and separated three times, after which the appropriate minimum size retention-force gauge shall be applied.

##### b) Male contacts

Each contact to be tested shall have a minimum size gauge engaged and separated three times, after which the appropriate maximum size retention-force gauge shall be applied.

#### 14.2.2 Method 3, Using Multiple-Contact Gauges

- a) The component sizing gauge shall be engaged and separated three times.
- b) The individual-contact retention-force gauge shall then be applied to each of the test contacts.

### 14.3 Test Requirements

The contacts tested shall support the weight of the contact retention-force gauge in a vertically downward direction.

### 14.4 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

- a) method of mounting and preparation of the specimen and whether the contacts are to be wired, etc;
- b) the number of sizings, if other than three;
- c) the number of contacts to be tested;
- d) details of the gauges and test jigs to be used; and
- e) any deviation from the standard test method.

## 15 TEST 16f : ROBUSTNESS OF TERMINATION

### 15.0 General

The object of this test is to detail a standard method to assess the ability of the terminations

to withstand the mechanical stresses likely to be applied during normal assembly operations.

### 15.1 Test Method

The terminations shall be tested in accordance with Test U of IS 9000 (Part 19/Sec 1 to 5) : 1986.

### 15.2 Final Measurements

Visual examination [ Test 1a of IS 12448 ( Part 2/Sec 1 ) : 1988 ]

### 15.3 Requirements

There shall be no damage which would impair normal operation.

### 15.4 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

- a) Applicable tests;
- b) Method of preparation and mounting of the specimen;
- c) Test conditions, such as values of the forces, number of bends, etc; and
- d) Any deviation from the standard test method.

## 16 TEST 16g : MEASUREMENT OF CONTACT DEFORMATION AFTER CRIMPING

### 16.0 General

The object of this test is to detail a standard method to assess the ability of contacts to withstand the crimping operation without deformation beyond specified limits.

### 16.1 Preparation of the Specimen

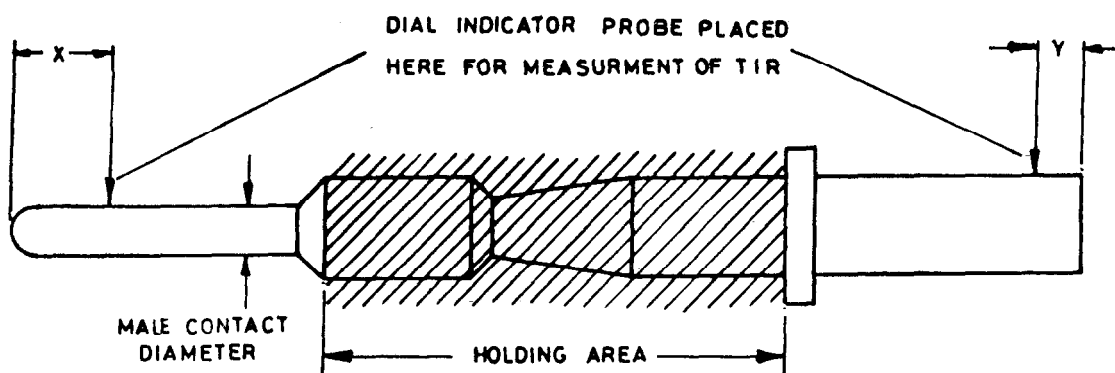
The sample shall consist of twenty ( 20 ) specimens ( contact-wire assemblies ) for each specified barrel size. Ten ( 10 ) specimens shall be fitted with the largest wires and ten ( 10 ) with the smallest wires specified. The lead length shall be not less than 100 mm ( 4 in ).

Care shall be taken to use the specified crimping tool. The following details shall be recorded for each specimen:

- tool part number,
- setting or die part number,
- positioner locator part number ( if used ).

### 16.2 Test Method

The contact shall be held in a collet in the shaded area shown in Fig. 1, that the contact can be rotated around the longitudinal axis to permit measurements at the specified points.



$X = 2 \times \text{Male contact diameter}$ , and

$Y = \text{Approximately half the distance between the end of the crimp barrel and the near edge of the crimp indentation.}$

FIG. 2 CONTACT HOLDING AREA FOR DEFORMATION MEASUREMENT

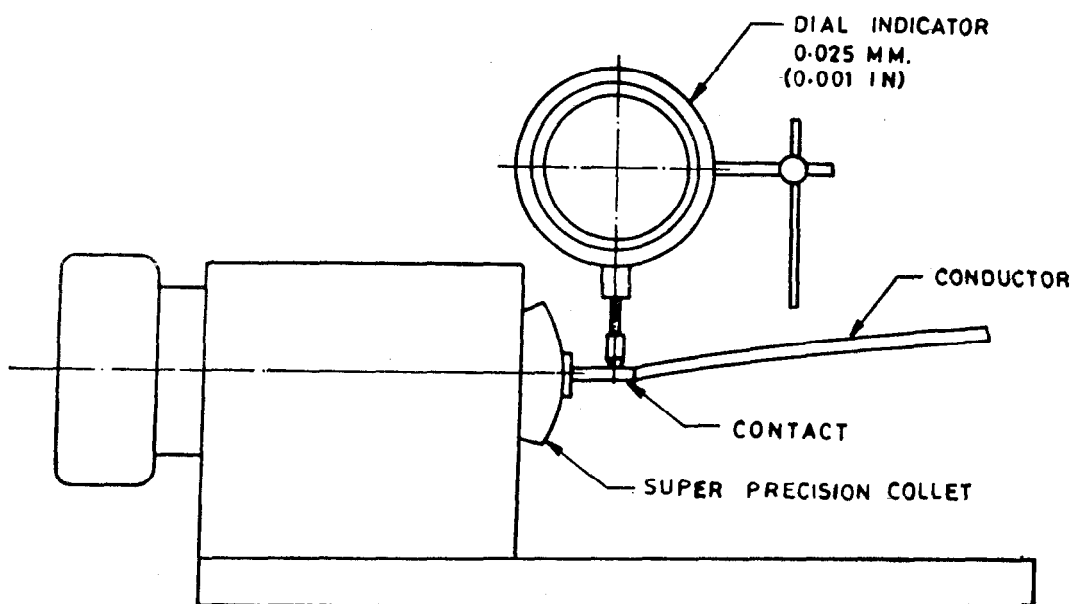


FIG. 3 TYPICAL TEST ARRANGEMENT FOR DEFORMATION MEASUREMENT

A suitable test arrangement is shown in Fig. 2. The precision of the collet shall be such that the run-out of a steel gauge pin of approximately 1.6 mm (0.063 in) diameter measured 13 mm (0.512 in) from the face of the collet shall not exceed 0.013 mm (0.000 5 in).

Indicator readings shall be taken at the points specified in Fig. 1, before and after crimping. The total indicated reading (TIR) is the total excursion of the indicator when the contact is rotated through 360°. Half of this measure is the deformation.

### 16.3 Requirements

The total indicated reading (TIR) shall be within the specified limits.

### 16.4 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

- Wire type and size and crimping tool to be used,
- Maximum value of total indicated readings of deformation, and
- Any deviation from the standard test method.

## 17 TEST 16h : INSULATION GRIP EFFECTIVENESS ( CRIMPED CONNECTIONS )

### 17.0 General

The object of this test is to detail a standard method to assess the ability of an insulation

grip to hold the insulation of a cable/wire under specified conditions.

### 17.1 Preparation of the Specimen

The specimen shall consist of a crimp contact or a terminal end and the specified cable/wire and shall be prepared in accordance with the detail specification.

The unstripped cable/wire of a length not less than 100 mm shall be fitted to the insulation grip. The crimp contact/terminal end shall then be crimped in the normal manner but the cable wire shall be held by the insulation grip only.

### 17.2 Test Method

#### 17.2.1 Winding Test

A mandrel having a diameter equal to that specified for the flexibility test of the relevant wire shall be used.

The crimp contact/terminal shall be held tangential to the mandrel.

The wire shall be wound around the mandrel for at least one turn and shall be in contact with the mandrel where it enters the insulation grip. Sufficient tension, as specified in the detail specification, should be applied to the wire to keep it in contact with the mandrel. A test made by first winding the wire in one direction, as shown in Fig. 4a and then in the opposite direction, as shown in Fig. 4b shall be considered to be one cycle. The total number of cycles shall be as specified by the detail specification.

### 17.3 Final Measurements

**17.3.1** The specimen shall be visually examined using magnification, unless otherwise specified by the detail specification.

**17.3.2** When specified by the detail specification, the conductor shall be withdrawn from the

cable/wire so that any damage to the conductor can be observed. This may be done by stripping the insulation from the far end of the cable/wire and applying a tensile load between the bared conductor and the crimped terminal.

### 17.4 Requirements

The specimen shall withstand the specified number of cycles of the winding test. The insulation shall not be damaged in a manner that could impair its function and should remain in position in the insulation grip.

When the conductor damage examination is carried out, the conductor of the cable/wire shall not show any damage in the zone of the insulation grip.

### 17.5 Details to be Specified

When this test is required by the detail specification, the following details shall be specified:

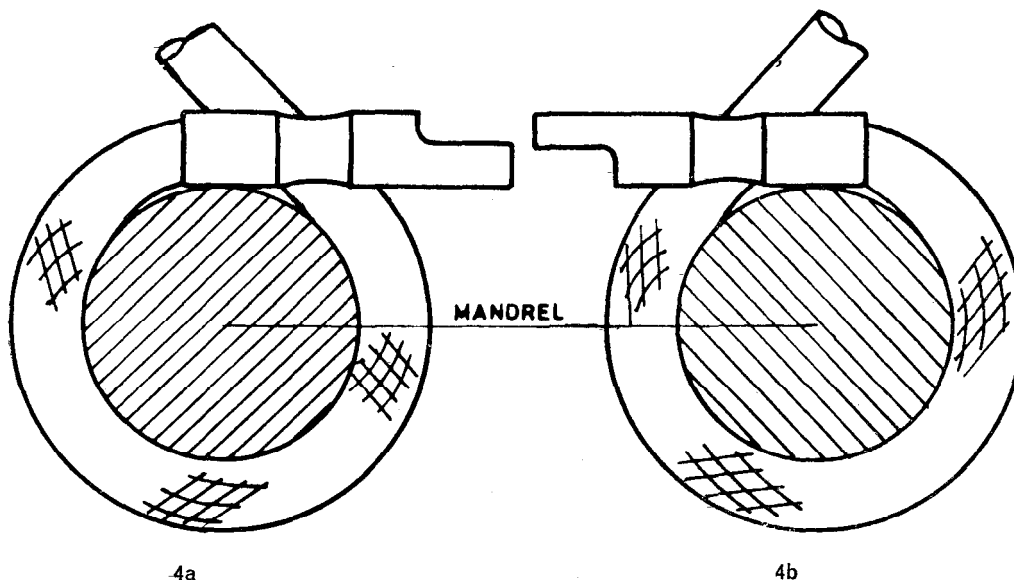
- Preparation of the specimen;
- Cable/wire, type, size to be used;
- Type of die setting of crimping tool;
- Tension to be applied;
- Number of cycles of the winding test to be performed;
- Visual examination by magnification, if required;
- Conductor damage examination, if required; and
- Any deviation from the standard test method.

### 18 TEST 16i : CONTACT PRESSURE

Under consideration.

### 19 TEST 16j : MINIMUM NORMAL FORCE

Under consideration.



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#### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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